A SPORTS BALL VALVE

FIELD OF THE INVENTION

The present invention relates broadly to a valve and relates particularly, though not exclusively, to a sports ball valve.

BACKGROUND TO THE INVENTION

Figures 1 and 2 show cross-sectional representations of a sports-ball valve 1. The valve 1 is encased in a casing 2 that is glued or otherwise fixed to an inflatable bladder 3. The valve 1 includes an axially disposed and throughgoing passageway 4 having an expandable but otherwise normally closed valve port 5.

In operation the inflatable bladder 3 is inflated by a manual pump (not shown) to which an injector 6 is threadably connected 4. The injector 6 is, as best shown in figure 2, pushed through the passageway 4 of the valve 1 so that it penetrates the expandable port 5. The valve 1 forms a seal about the injector 5 to limit the escape of air during inflation of the bladder 3.

This conventional sports ball valve 1 suffers from at least the following drawbacks:

1. forcing the injector 6 into the valve passageway 4 and penetration through the expandable port 5 damages the material of the valve 1 resulting in leakage;

2. forcing the injector 6 through the valve 1 when the bladder is deflated is known to puncture the opposing side of the bladder rendering it useless;

3. the injector 6 may during this relatively forceful insertion process or during inflation of the bladder 3 be snapped off within the valve 1; and

4. the sports ball cannot be inflated without an injector which may not always be readily available.

SUMMARY OF THE INVENTION

In a first aspect, the present invention provides a sports ball valve comprising:

a mounting member being adapted to provide for mounting of the valve; and

a valve element connected to the mounting member and being of a conical or frusto-conical shape having its reduced diameter portion directed in a forward flow direction, the valve element including a collapsible aperture located at or adjacent the reduced diameter portion and which in an open condition allows for flow of a fluid in the forward direction through the valve whilst in a closed condition the collapsible aperture prevents flow of the fluid in a reverse direction, the collapsible aperture being opened by the fluid pressure alone.

The sports ball valve is preferably arranged for inflation without penetrating the valve element or collapsible aperture with an injector thereby avoiding damage to the valve element and adjoining components.

The sports ball valve may be configured to provide opening of the collapsible aperture on application of a predetermined axial force to the mounting member.

Suitably, the sports ball valve includes an isolation zone disposed intermediate the mounting member and the valve element and being configured to reduce the likelihood of inadvertent opening of the collapsible aperture on application of operational forces to the mounting member. In a preferred form of the first aspect of the present invention, the isolation zone includes a peripheral recess at which the cross-sectional area of the valve is reduced. Suitably, the isolation zone is approximately 30 to 80% of the maximum cross-sectional area of the conical or frusto-conical-shaped valve element.

In a second aspect, the present invention provides a valve comprising:

a mounting member being adapted to provide for mounting of the valve; and

a valve element including a collapsible aperture which in an open condition allows for flow of a fluid in a forward direction through the valve whilst in a closed condition the collapsible aperture prevents flow of fluid in a reverse direction, the valve element being connected to the mounting member via an isolation zone that reduces likelihood of the collapsible aperture moving to the open condition under impact.

Suitably, the collapsible aperture of the second aspect of the present invention is arranged to open under fluid pressure alone.

The valve of the second aspect of the present invention may comprise another mounting member, the other mounting member being connected to the mounting member via one or more of the isolation zones or additional isolation zones which allow the mounting member and the other mounting member to move substantially independently of each other.

The valve element is preferably at least in part formed from a resilient material. Suitably, the isolation zone is more flexible than the valve element. The isolation zone may comprise an annular recess at which the cross-sectional area of the valve is reduced. In a preferred form the isolation zone comprises a narrowed neck portion of the valve which joins the mounting member and valve element. The cross-sectional area of the valve at the isolation zone is preferably approximately 30 to 80% of the maximum cross-sectional area of the valve element. The isolation zone may be one of two or more isolation zones.

The mounting member and other mounting member may be connected to, or arranged for connection to, a mounting surface. One of the mounting surfaces may be connected to or form part of a first vessel. Another of the mounting surfaces may be connected to or form part of a second vessel.

The one or more additional isolation zones may comprise a flexible sleeve that surrounds at least in part the isolation zone of the valve element. The flexible sleeve may comprise a sleeve which is extendable and contractible in an axial direction.

In a third aspect, the present invention provides a valve comprising:

a mounting member being adapted to provide for mounting of the valve; and

a valve element connected to the mounting member and including a collapsible aperture which in an open condition allows for flow of a fluid in a forward direction through the valve whilst in a closed condition the collapsible aperture prevents flow of the fluid in a reverse direction, the valve element being configured to provide opening of the collapsible aperture on application of a predetermined force to the mounting member.

Suitably, the valve element of the second and third aspects of the present invention is of a conical or frusto-conical shape having its reduced diameter portion directed in the

forward flow direction and the collapsible aperture is located at or adjacent the reduced diameter portion.

The collapsible aperture of the second and third aspects of the present invention may be arranged to receive an injector.

The mounting member of the second and third aspects of the present invention may be connected to, or arranged for connection to, an inflatable bladder.

Suitably, the mounting member is either disc-shaped or in the form of a cylinder connected to and coaxial with the conical or frusto-conical shaped valve element.

Suitably, application of said predetermined force to the mounting member involves applying a predetermined axial force which promotes opening of the collapsible aperture for inflation of the ball. Application of said predetermined axial force to the mounting member may promote deflation of the ball.

The mounting member is preferably formed integral with the valve element so that the valve is of a one-piece construction.

The valve may be formed predominantly of a polymeric or rubber material.

BRIEF DESCRIPTION OF THE FIGURES

In order to achieve a better understanding of the nature of the present invention a preferred embodiment of a valve will now be described, by way of example only, with reference to the accompanying drawings which:

Figures 1 and 2 are cross-sectional views of a conventional sports ball valve;

Figure 3 is a side elevational, sectional and bottom view of a valve according to one embodiment of the invention;

Figure 4 is a cross-sectional view of another embodiment of a valve according to the invention;

Figure 5 is an elevational, sectional and inverted plan view of a further valve according to the invention;

Figure 6 is an elevational and sectional view of yet another embodiment of a valve of the invention;

Figure 7 are schematic cross-sectional and plan views of yet further embodiments of valves according to the invention; and

Figure 8 is a sectional, plan and photographic representation of yet another embodiment of a valve according to the invention.

DETAILED DESCRIPTION OF THE EMBODIMENT

As shown in figure 3 there is a valve 10 of one embodiment of the invention which according to this particular aspect is designed to be installed in a sports ball (not shown). This sports ball valve 10 comprises a mounting member designated generally as 12 and a valve element 14.

The mounting member 12 includes a relatively thin disc having an increased wall thickness toward its axis. The mounting member 12 is connected or in this example formed integral with the valve element 14 which is frusto-conical in shape. The valve 10 includes an axially disposed passageway 16 which is throughgoing. The passageway 16 is shaped generally cylindrical at the mounting member 12 and tapers inwardly to form a wedge-shaped portion 18 within the valve element 14. The wedge-shaped portion 18 is then formed continuous with a collapsible and generally rectangular-shaped aperture 20 which extends through the valve element 14 and exits the reduced diameter portion of the cone.

The sports ball valve 10 of this embodiment includes an isolation zone located intermediate the mounting member 12 and the valve element 14. In this particular embodiment the isolation zone comprises a peripheral recess 22 The peripheral recess 22 is generally circular in cross-section and has a cross-sectional area approximately 50% of that of the maximum cross-sectional area of the valve element 14. The sports ball valve is as such of a bulbous configuration.

In use, the isolation zone reduces the sensitivity of the collapsible aperture 20 to external operational forces applied to the ball, for example from bouncing, kicking or passing of the sports ball. The collapsible aperture 20 is thus less likely to inadvertently open as a result of these operational forces which result in pressure loss from the sports ball.

The sports ball valve 10 of this embodiment is constructed of a rubber-like material. The valve 10 is of a one-piece construction and the rubber-like material serves to bias the collapsible aperture 20 into a closed condition.

The sports ball valve 10 is fitted to a sports ball or sports ball bladder in a traditional manner where for example it is glued or otherwise adhered to an inner surface of the ball or bladder. The sports ball valve 10 is designed to be used without an injector whereupon the inflating pressure alone of the inflation fluid, most typically air, serves to open the collapsible aperture 20 into its open condition. Otherwise, the collapsible aperture 20 is biased in a normally closed condition. In one example a manual air pump (without an injector) is pressed against the inlet of the passageway 16 and on inflation the inflating fluid which is forced into the passageway 16 expands the collapsible 20 aperture and inflates the sports ball.

Figure 4 shows another embodiment of a sports ball valve 30 of the present invention which is identical to the valve 10 except that it has two isolation zones in form of recesses 32 rather than the recess 22. The valve 30 is therefore less sensitive to external operational forces than the valve 10.

Figure 5 illustrates another embodiment of a valve 36 which is described by reference to the sports ball valve 10 of Figure 3. Likes features of valves 10 and 36 are referred to by common reference numerals. The valve 36 comprises a valve element 14 which is attached to a mounting member 12 via an isolation zone having a peripheral recess 22. The valve 36 also includes another mounting member generally designated as 38 which is connected to the mounting member 12 via additional isolation zones designated generally as 40. The mounting members 12 and 38 form part of respective inner and outer vessels (not shown). The isolation zones 40 allow the mounting members 12 and 38 to move a small amount independently of each other to minimise transferral of operational forces between the outer and inner vessels.

Figure 6 shows another embodiment of a valve 46 which is also described by reference to the sports ball valve 10 of Figure 3. Like features of the valve 10 and 46 are referred to by common reference numerals. The valve 46 includes a valve element 14 and mounting member 12 connected via an isolation zone having a peripheral recess 22, as described above in relation to valves 10 and 36. The valve 46 also includes another mounting member generally designated as 48 which is connected to the mounting member 12 via a flexible sleeve in the form of a flexible tube 50. The mounting members 48 and 12 may form part of respective inner and outer vessels as described above in relation to the valve 36. The inner vessel of the valve 46 may for example be a water or fuel tank and the flexible tube 50 may provide access to the tank via an associated outer vessel which may for example comprise a housing of the inner vessel.

As shown in figure 7 there are further examples of a valve such as 70 which are preferably in the form of sports ball valves. These are essentially variants of the sports ball valve 10 of figure 3 but without the isolation zone or periphery recess 22. The alternate sports ball valves 70 each include a mounting member designated generally as 72 connected to and in this example formed integral with a valve element 74. The mounting member 72 is a disc-shaped member and is connected coaxially with the valve element 74 which is conical in shape. The valves 70 each include a throughgoing and axially located passageway 76. The passageway 76 includes a cylindrical portion located at the disc-shaped mounting member 72 and extending into the valve element 74 whilst being formed continuous with a collapsible aperture 78. The collapsible aperture 78 exits the conical-shaped valve element 74 at its apex. The collapsible aperture 78 comprises a single slit. However, the collapsible aperture 78 may comprise multiple slits that intersect at a line which is coaxial with the valve element 74 and exits the valve element 74 at its apex.

The valves 70 of figure 7 are similarly designed to be inflated relying on the inflating fluid pressure alone without the need for an injector. In a similar manner to the described inflation of the sports ball valve of figure 3, these alternate sports ball valves 70 are inflated by applying the manual inflation pump (or other inflation means) to the sports ball so as to apply sufficient fluid pressure to the passageway 76 to expand the collapsible aperture 78. These ball valves 70 are also designed so that application of a predetermined and axially directed force to the mounting member 72 within a circular region 80 promotes opening of the collapsible aperture 78. The predetermined force is relatively high and exceeds that which may under normal working conditions be applied to the sports ball when it is bounced, kicked or passed. This application of the predetermined force to the mounting member 72 promotes opening of the collapsible aperture 78 either during inflation of the sports ball or so as to partly or fully deflate the sports ball.

Figure 8 illustrates another embodiment of a valve 90 which according to this aspect of the invention is designed to be fitted to an inflatable tyre (either tubed or tubeless). The tyre valve 90 is in this example designed to replace a conventional Schrader valve design. The tyre valve 90 is fitted to a screw-threaded adapter 92 which allows it to be fitted to an existing tyre installation.

The tyre valve 90 is of a one-piece construction and fabricated from a polymer material. The valve 90 includes a mounting member 94 formed integral with a valve element 96. The mounting member 94 is generally cylindrical in shape and includes an inwardly directed flange 98 which engages a complementary-shaped recess 100 within the adapter 92.

The valve element 96 is a relatively thick walled and conically-shaped member having a collapsible and coaxially located aperture 102.

A bike tyre (not illustrated) containing a tube having a threaded valve stem to which the tyre valve 90 is fitted. The tyre is inflated by the introduction of pressurised fluid into the collapsible aperture 102 so as to expand it and inflate the tyre. The adapter 92 includes an inlet port 104 to which inflating fluid pressure is applied for opening of the collapsible aperture 102. The adapter 92 is designed for connection to a standard inflation coupling (not shown) to which a pneumatic air supply is connected. The tyre valve 90 is thus actuated by the inflating fluid pressure alone without the need for an injector.

Now that a preferred embodiment of the present invention has been described in some detail, it will be apparent to those skilled in the art that the valve has at least the following advantages over the admitted prior art:

1. The valve can be actuated or opened relying on the inflating fluid pressure alone and as such an injector is not required;

2. The valve is relatively simply in construction;

3. The valve is designed and configured to reduce leakage or flow in the reverse direction; and

4. The valve can in an alternate construction be deflated or opened by application of a predetermined force to its mounting member.

Those skilled in the art will appreciate that the invention described herein is susceptible to variations and modifications other than those specifically described. For example, the valve need not be of a one-piece construction as described and it may be fabricated from any suitable material depending on the application and working parameters. The specific shape and configuration of the valve need not be limited to that described and illustrated but rather extends to other configurations which are within the scope of the broadest aspects of the invention.

All such variations and modifications are to be considered within the scope of the present invention the nature of which is to be determined from the foregoing description.